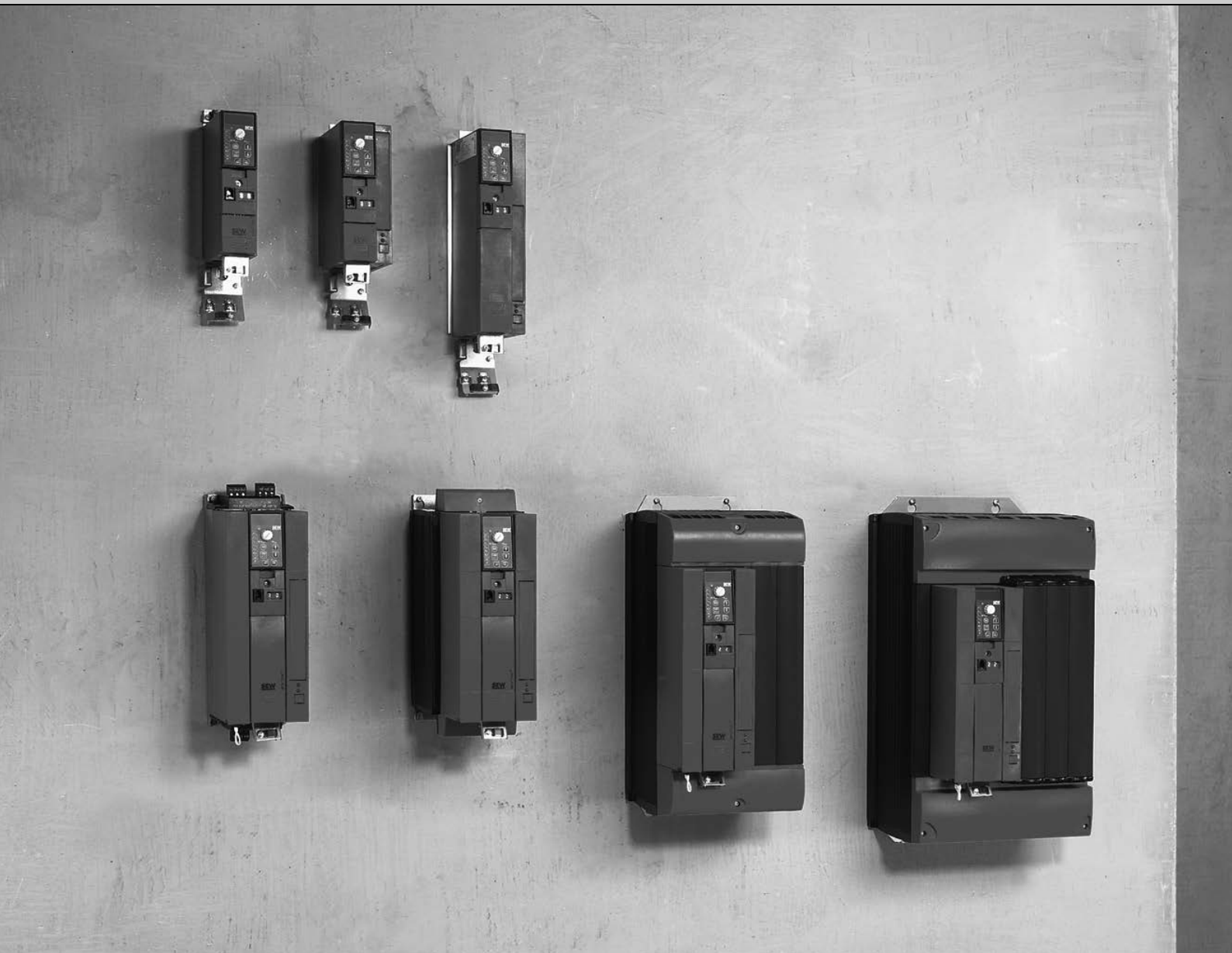




SEW
EURODRIVE

Manual



MOVITRAC® B Simple Positioning Application Module





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1 General Information

1.1 How to use this documentation

The documentation is part of the product and contains important information. The documentation is for everyone who works with this product.

The documentation must be accessible and legible. Make sure that persons responsible for the system and its operation, as well as persons who work independently with the software and the connected devices from SEW-EURODRIVE, have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation, or if you require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of the signal words

The following table shows the grading and meaning of the signal words for safety notes, notes on potential risks of damage to property, and other notes.

Signal word	Meaning	Consequences if disregarded
▲ DANGER	Imminent danger	Severe or fatal injuries
▲ WARNING	Possible dangerous situation	Severe or fatal injuries
▲ CAUTION	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the drive system or its environment
INFORMATION	Useful information or tip: Simplifies the handling of the drive system.	

1.2.2 Structure of the section-related safety notes

Section safety notes do not apply to a specific action, but to several actions pertaining to one subject. The used symbols indicate either a general or a specific hazard.

This is the formal structure of a section safety note:



▲ SIGNAL WORD

Type and source of danger.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the danger.

1.2.3 Structure of the embedded safety notes

Embedded safety notes are directly integrated in the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

- **▲ SIGNAL WORD** Nature and source of hazard.
Possible consequence(s) if disregarded.
– Measure(s) to prevent the danger.



1.3 Right to claim under warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the documentation at hand. Therefore, read the documentation before you start working with the software and the connected devices from SEW-EURODRIVE.

Make sure that the documentation is available to persons responsible for the machinery and its operation as well as to persons who work independently on the devices. Also ensure that the documentation is legible.

1.4 Exclusion of liability

You must adhere to this documentation and the documentation of the connected devices from SEW-EURODRIVE to ensure safe operation and to achieve the specified product characteristics and performance features.

SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of the documentation. In such cases, any liability for defects is excluded.

1.5 Copyright

© 2010 – SEW-EURODRIVE. All rights reserved.

Unauthorized duplication, modification, distribution or any other use of the whole or any part of this documentation is strictly prohibited.

1.6 Product names and trademarks

All brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.7 Applicable documentation

Observe the following applicable documents:

- MOVITRAC® B operating instructions and associated manuals

Make sure you always use the latest documentation and software version.

Our documentation is available in various languages for download from the SEW homepage. If you are unclear about any of the information in this documentation, or if you require further information, please contact SEW-EURODRIVE.

If required, you can order printed copies of the documentation from SEW-EURODRIVE GmbH & Co KG.



1.8 Terms of use

SEW-EURODRIVE grants the temporarily unrestricted right to use a copy of the software including the corresponding documentation and media (together called "material") according to the detailed terms of use and other contractual agreements.

Updates or extensions of the used material that are made available to you within the framework of a transition agreement or another agreement (e.g. maintenance contract) are also part of the provided material.

The complete material belongs to SEW-EURODRIVE and is protected by copyright. Unless there are any legal exceptions, it is prohibited to

- copy the material temporarily or permanently in whole or in part, except for designated and contractual use or to create a legally permitted backup to ensure future use,
- translate the software, modify it, or copy the results.

You are obliged to prevent unauthorized access of third parties to the provided material. SEW-EURODRIVE remains the proprietor of all rights, even if you modify the material or combine it with your own or third party programs.



2 Safety Notes

2.1 General information

The following basic safety notes must be read carefully to prevent injury to persons and damage to property. The operator must ensure that the basic safety notes are read and adhered to.

Ensure that persons responsible for the machinery and its operation as well as persons who work independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or if you require further information, please contact SEW-EURODRIVE.

The following safety notes refer to the use of the software. Also adhere to the supplementary safety notes in this document and in the documentation of the connected devices from SEW-EURODRIVE.

This document does not replace the detailed documentation of the connected devices. This document assumes that the user has access to and is familiar with the documentation for all connected devices from SEW-EURODRIVE.

Never install or start up damaged products. Submit a complaint to the shipping company immediately in the event of damage.

During operation, the devices may have live, uninsulated, and sometimes moving or rotating parts as well as hot surfaces depending on their degree of protection.

Removing covers without authorization, improper use as well as incorrect installation or operation may result in severe injuries to persons or damage to property. Refer to the documentation for additional information.

2.2 Target group

Any work with the software may only be performed by adequately qualified personnel. Qualified personnel in this context are persons who have the following qualifications:

- Appropriate instruction.
- Knowledge of this documentation and other applicable documentation.
- SEW-EURODRIVE recommends additional product training for products that are operated using this software.

Any mechanical work on connected units may only be performed by adequately qualified personnel. Qualified staff in the context of this documentation are persons familiar with the design, mechanical installation, troubleshooting and servicing of the product who possess the following qualifications:

- Training in mechanical engineering, e.g. as a mechanic or mechatronics technician (final examinations must have been passed).
- Knowledge of this documentation and other applicable documentation.



Any electrical work on connected units may only be performed by adequately qualified electricians. Qualified electricians in the context of this documentation are persons familiar with electrical installation, startup, troubleshooting and servicing of the product who possess the following qualifications:

- Training in electrical engineering, e.g. as an electrician or mechatronics technician (final examinations must have been passed).
- Knowledge of this documentation and other applicable documentation.
- Knowledge of the relevant safety regulations and laws.
- Knowledge of the other standards, guidelines, and laws mentioned in this documentation.

The above mentioned persons must have the authorization expressly issued by the company to operate, program, configure, label and ground units, systems and circuits in accordance with the standards of safety technology.

All work in further areas of transportation, storage, operation and waste disposal must only be carried out by persons who are trained appropriately.

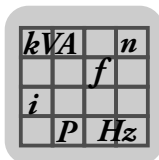
2.3 Designated use

The "Simple Positioning" application module is used in applications that are less complex than a system with motor encoder evaluation.

The "Simple Positioning" application module must only be used in connection with the technology variant (/T) of MOVITRAC® B with the corresponding fieldbus interfaces.

2.4 Bus systems

A bus system makes it possible to adapt frequency inverters and/or motor starters to the specific conditions of the machinery within wide limits. This results in the risk that a change of parameters that cannot be detected externally can result in unexpected, though not uncontrolled, system behavior.



3 System Description

3.1 Fields of application

The "Simple Positioning" application module replaces applications previously realized with rapid/creep switch-over and initiator evaluation. The variable definition of any set-point position along with different speeds and acceleration ramps ensures more flexibility.

With an accuracy of 1/4 of a motor revolution, the "Simple Positioning" application module is suitable for the following industries and applications with non-dynamic positioning:

- **Materials handling**
 - Trolleys
 - Roller conveyers
- **Logistics**
 - Trolleys
 - Transverse carriages
- **Format adjustment**

"Simple Positioning" offers the following advantages in these applications:

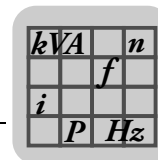
- User-friendly user interface.
- You only have to enter the parameters required for simple positioning (reduction ratios, speeds, diameters).
- Guided parameter setting process instead of complicated programming.
- Monitor mode for optimum diagnostics.
- Users do not need any programming experience.
- It does not take long to get to know the system.

Consider the following properties for project planning:

- No direct position control
 - To hold a position, the application of the brake is activated in the position window.
- No time-critical positioning tasks
- Supported encoder types:
 - Built-in encoder EI7C (96 increments/revolution)
 - HTL encoder

Simple Positioning can be operated in two ways:

- Control via fieldbus gateway (SBus) using 3 process data words (functionally compatible with bus positioning of MOVIDRIVE® B)
- Control via terminals using digital module FIO21B



3.2 Simple Positioning speed characteristics

The speed characteristics of Simple Positioning are divided into the following phases:

- Acceleration and constant travel

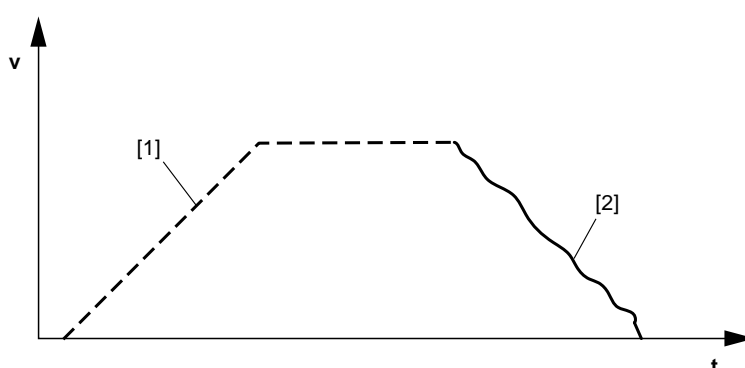
The motor speed is increased to the setpoint speed along the specified setpoint ramp. The motion sequence is controlled exclusively via the selected operating mode (e.g. V/f, VFC) of the inverter. Simultaneously with the movement, IPOS^{plus}® cyclically calculates the switch-over position for initiating the deceleration stage (run-in to target).

- Deceleration phase

When the calculated switch-over position is passed, the IPOS^{plus}® program takes over the speed control. When the drive reaches the target position (in consideration of the parameterized position window), the brake output is activated.

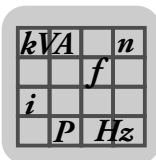
The deceleration phase can be controlled in two different ways. You can select them in the startup wizard in MOVITOOLS® MotionStudio in the "Scaling" window in the [encoder type] selection field.

- Method 1: IPOS^{plus}® controlled run-in to target with linear deceleration ramp and controlled brake application (standard method if "EI7C" encoder type is selected).



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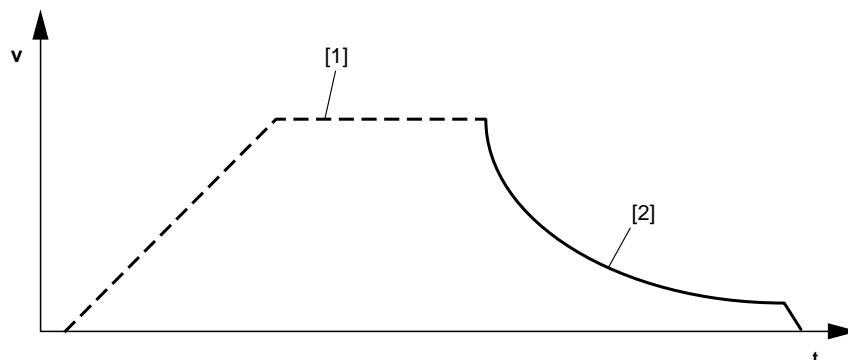
- [1] Speed curve in the acceleration and constant travel phases
- [2] Speed curve when approaching the target position



System Description

Simple Positioning speed characteristics

- Method 2: IPOS^{plus}®-controlled run-in to target with asymptotic deceleration ramp and controlled brake application (method compatible with MQx module if "HTL" encoder type is selected).



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- [1] Speed curve in the acceleration and constant travel phases
 [2] Speed curve when approaching the target position



4 Project Planning

4.1 Prerequisites

4.1.1 PC and software

The "Simple Positioning" application module is implemented as an IPOS^{plus}® program and forms part of the SEW MOVITOOLS® MotionStudio software version 5.60 and higher. In order to use MOVITOOLS® MotionStudio, you must have a PC with one of the following operating systems: Windows® 95, Windows® 98, Windows NT® 4.0 or Windows® 2000.

4.1.2 Inverters, motors and encoders

Inverter The "Simple Positioning" application module can only be used with MOVITRAC® B units in technology design (/T).

Motors Asynchronous DR motors with built-in EI7C encoder.

Encoder The encoder must be mounted directly to the motor. External mounting, e.g. in applications with non-positive connection between motor shaft and load, is not supported.

Technical data of the encoder input

Technical data of encoder input	
Encoder signals (2 tracks)	Tracks A and B
Phase position	90° ± 20°
Mark space ratio	1:1 ± 20 %
Max. pulse frequency	120 kHz
Connection of track A	MOVITRAC® B: Terminal X12:5 (DI04)
Connection of track B	MOVITRAC® B: Terminal X12:4 (DI03)
Reference potential	GND to PE potential



4.2 Functional description

4.2.1 Four operating modes

- **Jog mode**
 - The direction is selected via the 2 signals "Jog +" and "Jog –".
 - With control via fieldbus, the speed can be specified variably, and the ramp can be switched via a control bit.
 - With control via terminals, a terminal input switches between rapid and creep speed. The ramp is predefined during startup.
- **Teach mode (only with terminal control)**
 - In a referenced axis status, the actual position can be saved to the selected table position.
- **Referencing mode**
 - Reference travel establishes the reference point (machine zero) for absolute positioning operations.
- **Positioning mode**
 - In fieldbus control mode, the speed and target position can be specified variably, and the ramp can be switched via a control bit.
 - Control via terminals allows for binary selection of 8 positions with corresponding ramp and speed.

4.2.2 Limit switches, reference position and machine zero

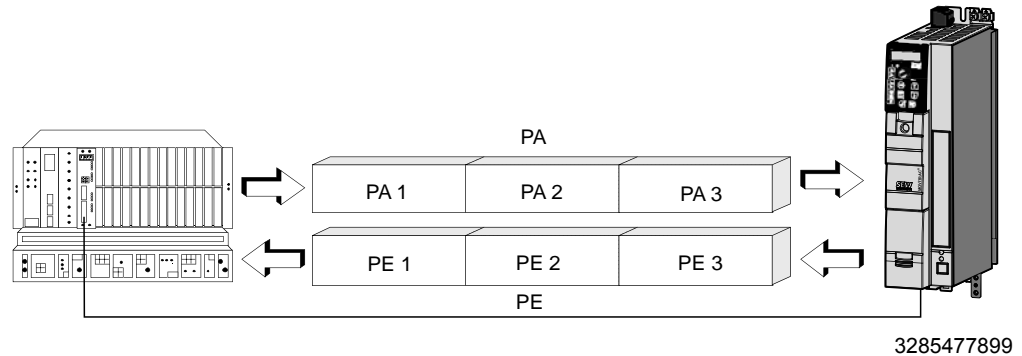
The hardware and software limit switches are evaluated in IPOS^{plus®}. Note the following points during project planning:

- The software limit switches must be located within the travel range of the hardware limit switches.
- You can enter a reference offset during startup if you do not want the machine zero to be located on the reference position. The following formula applies: Machine zero = reference position + reference offset. This way, you can alter the machine zero without having to move the reference position.



4.3 Process data assignment for control via fieldbus gateway (SBus)

The higher-level controller (PLC) sends three process output data words (PO1 – PO3) to the inverter and receives three process input data words (PI1 – PI3) from the inverter.



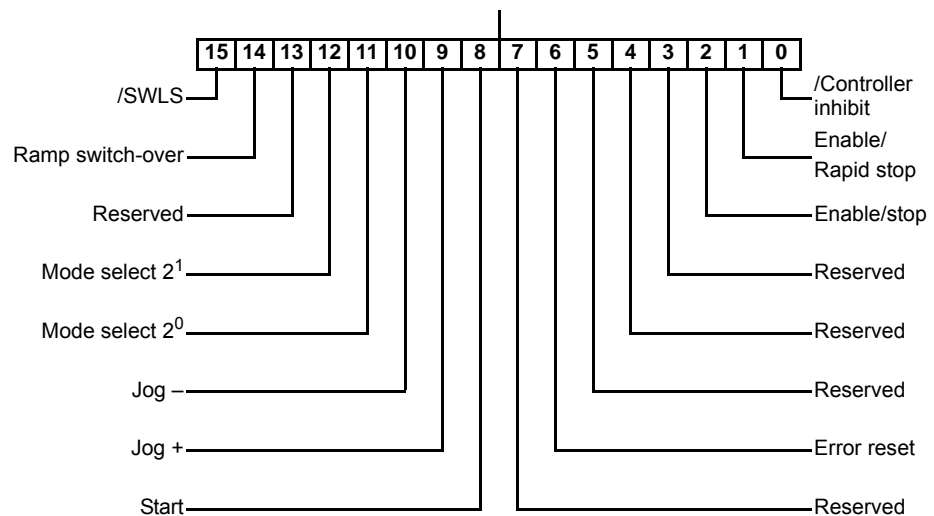
PO= Process output data
PO1 = Control word 2
PO2 = Setpoint speed
PO3 = Target position

PI= Process input data
PI1 = Status word (IPOS PI data)
PI2 = Actual speed
PI3 = Actual position

4.3.1 Process output data

The process output data words are assigned as follows:

- PO1: Control word 2



- PO2: Setpoint speed

PO2 setpoint speed (user unit)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
----	----	----	----	----	----	---	---	---	---	---	---	---	---	---	---

- PO3: Setpoint position

PO3 setpoint position (user unit)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
----	----	----	----	----	----	---	---	---	---	---	---	---	---	---	---



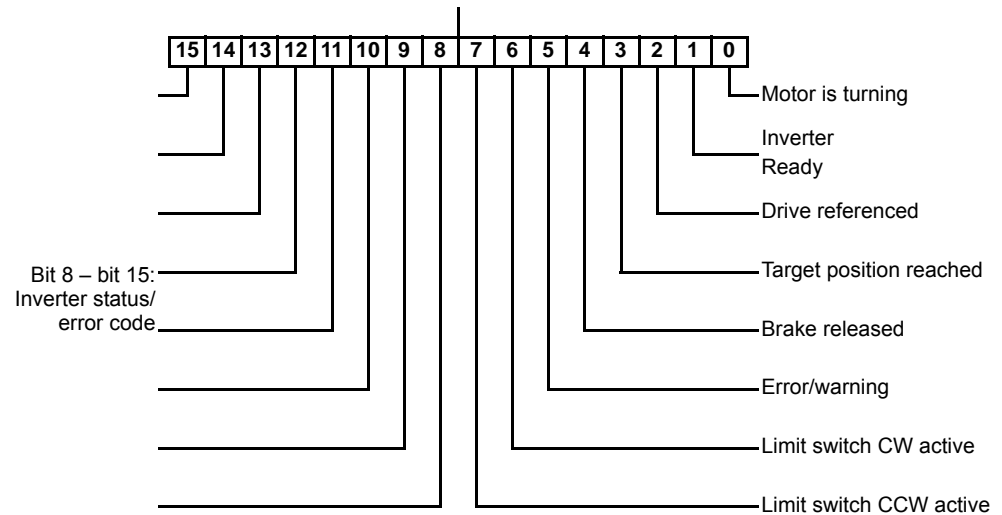
Project Planning

Process data assignment for control via fieldbus gateway (SBus)

4.3.2 Process input data

The process input data words are assigned as follows:

- PI1: Status word 1



- PI2: Actual speed

Actual speed (user unit)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
----	----	----	----	----	----	---	---	---	---	---	---	---	---	---	---

- PI3: Actual position

Actual position (user unit)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
----	----	----	----	----	----	---	---	---	---	---	---	---	---	---	---



5 Installation

5.1 MOVITOOLS® MotionStudio software

The "Simple Positioning" application module is available in MOVITOOLS® MotionStudio version 5.60 and higher. Proceed as follows to install MOVITOOLS® MotionStudio on your computer:

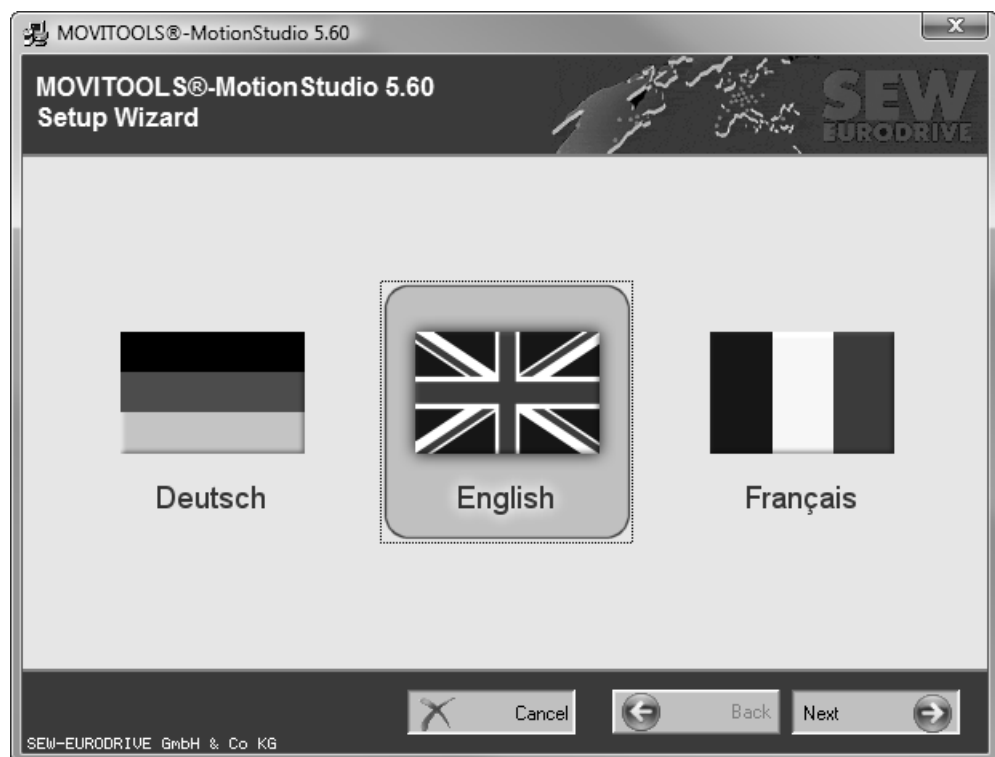
- Insert the MOVITOOLS® MotionStudio CD into the CD-ROM drive of your PC.
- Wait until the installation starts automatically. The "Start.htm" file is displayed in the browser.



INFORMATION

If the "Start.htm" file does **NOT** automatically open, open the file manually from the root directory of the installation CD.

- Click on the link "MOVITOOLS® MotionStudio".
- Click on the link "Start installation".
- The MOVITOOLS® MotionStudio setup wizard is started. You will be guided through the installation process: Follow the instructions.



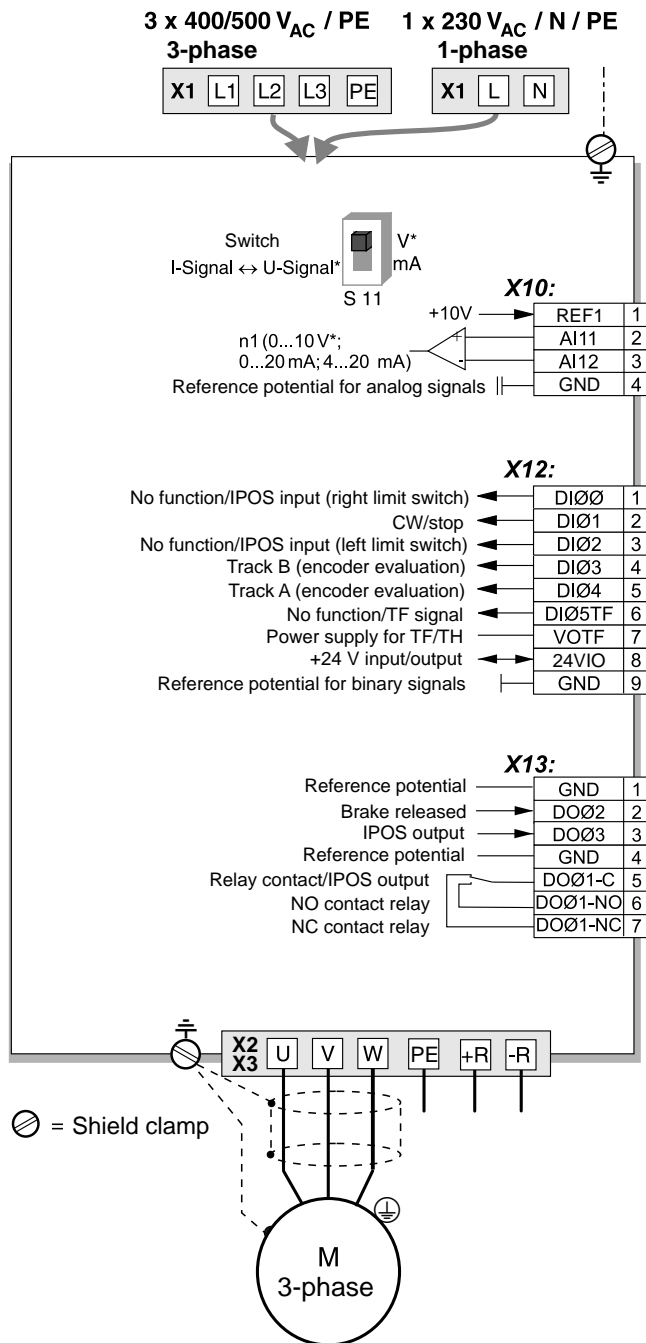
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5.2 Technology variant

The "Simple Positioning" application module can only be used with the technology variants (/T) of MOVITRAC® B units. The application module cannot be used with the standard unit variant (-00).

5.3 *Wiring diagram for MOVITRAC® B*

Irrespective of the bus type used, you must wire the basic MOVITRAC® B unit according to the following wiring diagram.



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Binary input	Assignment
X12:1 (DI00)	No function / IPOS input (limit switch right)
X12:2 (DI01)	CW/stop
X12:3 (DI02)	No function / IPOS input (limit switch left)
X12:4 (DI03)	IPOS input (connection of track B of encoder evaluation)
X12:5 (DI04)	IPOS input (connection of track A of encoder evaluation)
X12.6 (DI05)	No function / TF signal

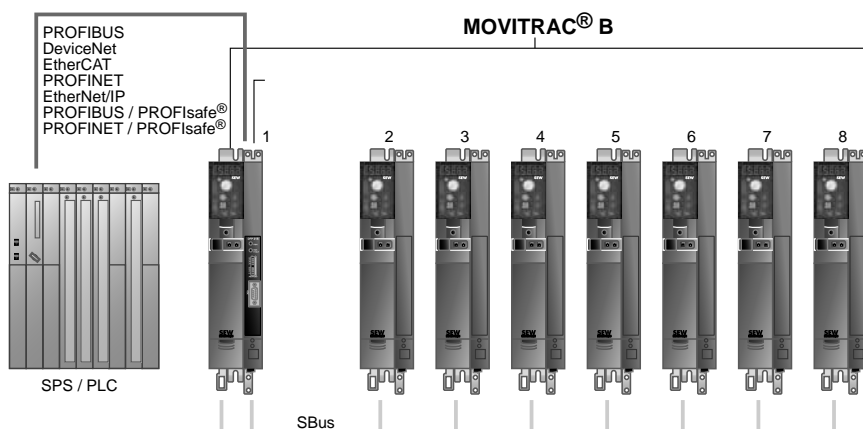


5.4 MOVITRAC® B bus installation

The fieldbus gateways convert standard fieldbuses to SBus. This means that up to 8 inverters can be addressed through one fieldbus gateway.

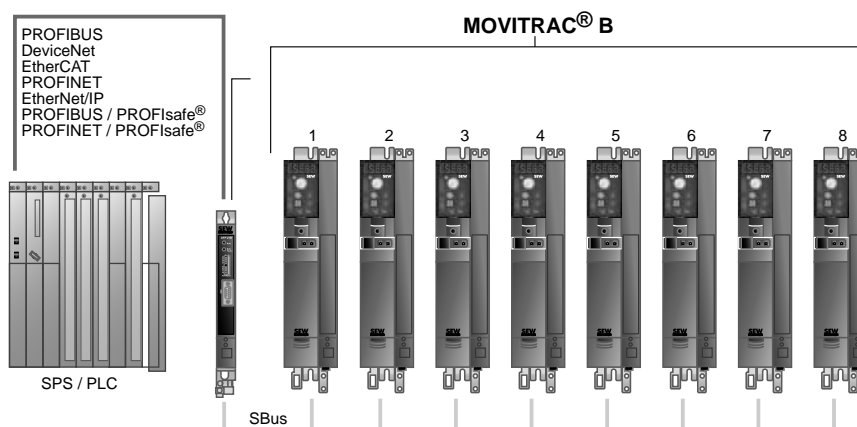
The gateway is available in 2 different variants:

- Integrated in the inverter: The fieldbus interface DF.B is installed in the inverter (see following figure).



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- In separate housing: The fieldbus interface DF.B is installed in a UOH11B housing, or is available as gateway (e.g. UF11B for INTERBUS) (see following figure).



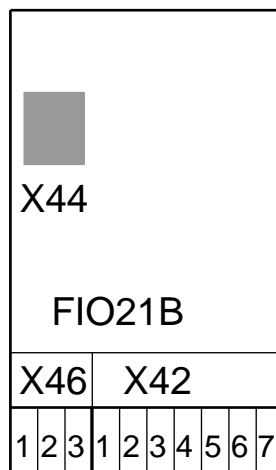
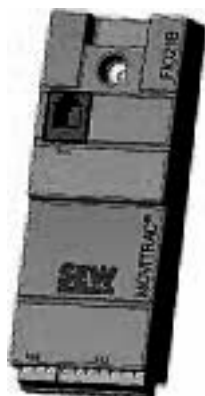
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Fieldbus gateways are available for connecting fieldbuses the following bus systems.

Bus	Separate housing	Integrated in the inverter (not in size 0XS)
PROFIBUS	DFP21B/UOH11B	MC07B.../FSC11B/DFP21B
DeviceNet	DFD11B/UOH11B	MC07B.../FSC11B/DFD11B
EtherCAT	DFE24B/UOH11B	MC07B.../FSC11B/DFE24B
PROFINET	DFE32B/UOH11B	MC07B.../FSC11B/DFE32B
EtherNet/IP	DFE33B/UOH11B	MC07B.../FSC11B/DFE33B
PROFIBUS / PROFIsafe	DFS11B/UOH11B	MC07B.../FSC11B/DFS11B
PROFINET / PROFIsafe	DFS21B/UOH11B	MC07B.../FSC11B/DFS21B
INTERBUS	UF11A (823 898 7)	–



5.5 Terminal control via FIO21B digital module



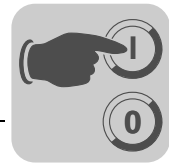
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Functions of the input terminals X42:1 – 7 at the FIO21B digital module:

Binary input terminal X42	Operating mode			
	Jog mode	Teach mode	Referencing mode	Positioning mode
DI10/X42:1	0	1	0	1
DI11/X42:2	0	0	1	1
DI12/X42:3	/SWLS	Start	Start	Start
DI13/X42:4	Jog +	Position 2 ⁰	Reserved	Position 2 ⁰
DI14/X42:5	Jog –	Position 2 ¹	Reserved	Position 2 ¹
DI15/X42:6	Rapid speed	Position 2 ²	Reserved	Position 2 ²
DI16/X42:7	Error reset	Error reset	Error reset	Error reset

Function of the output terminals (basic unit):

Binary output terminal X13	Operating mode			
	Jog mode	Teach mode	Referencing mode	Positioning mode
DO01/X13:1	/Fault	/Fault	/Fault	/Fault
DO02/X13:2	Brake released	Brake released	Brake released	Brake released
DO03/X13:3	No function	Position saved	Drive referenced	Drive in position



6 Startup

6.1 General information

Correct project planning and installation are the prerequisites for successful startup. Refer to the MOVITRAC® B system manual for detailed project planning instructions.

Check the installation, the encoder connection and the installation of the fieldbus interfaces by following the installation instructions in the MOVITRAC® B operating instructions, in the fieldbus manuals and in this manual.

6.2 Starting the "Simple Positioning" application module

6.2.1 General information

- Start MOVITOOLS® MotionStudio.
- Check the unit firmware (at least 1822.563.2.10). To do so, choose [Startup] / [Parameter tree] from the context menu of the unit. Select parameter *P076 Firmware of basic unit*.
- Startup the motor. Test in manual operation whether the motor has been started up correctly.
- Inhibit the unit (X12:2 DI01 CW/stop to "0")
- Start the "Simple Positioning" application module. To do so, choose [Application module] / [Simple positioning] from the context menu of the unit (see following figure).



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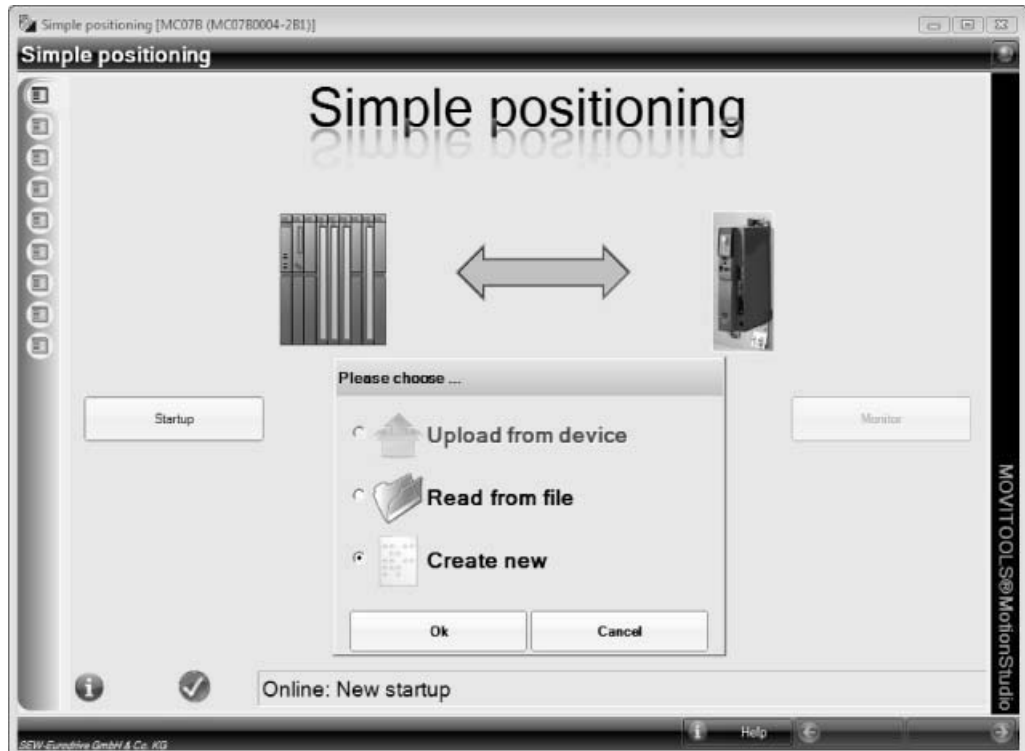


Startup

Starting the "Simple Positioning" application module

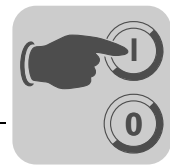
6.2.2 Initial screen

The initial screen of the "Simple Positioning" application module opens (see following figure).



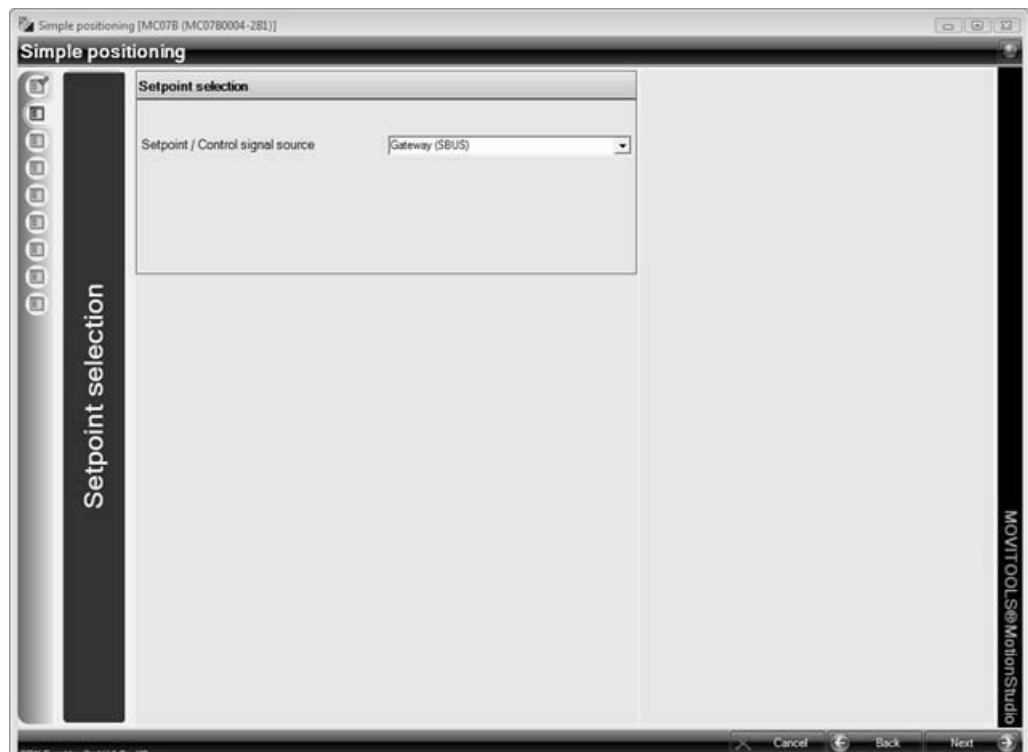
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- To commence startup, click the [Startup] button.
Select one of the following options:
 - "Create new" to perform the initial startup
 - "Read from file" to load an existing parameter set
 - "Upload from device" to perform a re-startup
 The following chapters describe the next steps.
- To monitor or control the started up application, click the [Monitor] button. For more information, refer to chapter "Operation and service".
The [Monitor] button is disabled when
 - You are not online
 - The application module has not been detected



6.2.3 Selecting a setpoint source

In this window, you can specify the setpoint/control signal source (see following figure).



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In the "setpoint/control signal source" dropdown menu, you specify whether the application is controlled via fieldbus gateway (setting: fieldbus gateway SBus) or via terminals (setting: terminal with FIO21B).



6.2.4 Calculating the scaling factors

In this window, you can set the scaling factors for distance and speed.

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Make the following settings in this window:

- **Calculating the scaling factors**

- Enter values in the "Diameter of driving wheel" field or the "Spindle pitch" field according to your application.
- In the edit boxes "Gearing ratio" and "External ratio", enter the total gear ratio of the drive with up to 2 decimal places.
- Select the unit of speed.
- "Encoder type" selection field

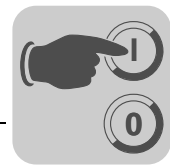
Encoder type "EI7C" is set by default. The control mode "IPOS^{plus}®-controlled run-in to target with linear deceleration ramp and controlled brake application" is activated.

If you use another encoder type, select "HTL". You can use the "HTL" setting also for applications with EI7C encoders (recommendation for systems prone to slip).

The control mode "IPOS^{plus}®-controlled run-in to target with asymptotic deceleration ramp and controlled brake application" is activated. Consider the internal quadrupling of the physical resolution when choosing the "HTL" setting. This means that for an encoder with a physical resolution of 24 increments/revolution, for example, you must enter the value "96".

- Click the [Calculation] button. The "Distance" scaling factor is determined and displayed in the "Pulses/distance" display field. The "Speed" scaling factor is determined and displayed in the "numerator/denominator" display field.

The scaling factors are limited to 2^{13} .



6.2.5 Setting parameters and limits

In this window, you can enter the position of the software limit switches, the reference offset, the reference travel type, and the speed limits.

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- **"Limit switch" group**

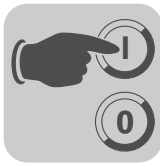
In the edit boxes "Software limit switch CCW/CW", enter the position of the software limit switches. Make sure the positions of the software limit switches are **within** the travel distance of the hardware limit switches and that they do not overlap the reference position. If you enter the value "0" in both edit boxes, the software limit switches are deactivated.

The processing of hardware and software limit switches is implemented in IPOS^{plus}®.

- **"Reference travel" group**

Enter the reference offset in user units in the "Reference offset" edit box. The reference offset is used to correct the machine zero. The following formula applies:

Machine zero = reference position + reference offset



Startup

Starting the "Simple Positioning" application module

- Select the correct reference travel type (3, 4, 5, 8) from the "Reference travel type" selection box. The reference travel type specifies the reference travel strategy that is used to establish the machine zero of a machine.

	<p>Type 3: The reference position is the CW hardware limit switch. No reference cam is required.</p> <p>Machine zero = reference position + reference offset</p>
	<p>Type 4: The reference position is the CCW hardware limit switch. No reference cam is required.</p> <p>Machine zero = reference position + reference offset</p>
	<p>Type 5: No reference travel. The reference position is the current position.</p> <p>Machine zero = current position + reference offset</p>
	<p>Type 8: No reference travel. The reference position is the current position. In contrast to type 5, type 8 reference travel can also be performed when the system is in status "No enable/controller inhibit".</p> <p>Machine zero = current position + reference offset.</p>

- Edit boxes for reference travel speed 1 and 2**

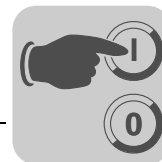
When selecting reference travel type 3 or 4, the hardware limit switch is "searched" with reference travel speed 1. Next, the drive moves away from the hardware limit switch with reference travel speed 2.

- "Speed limits" group**

- "Maximum speed positioning mode" input field
You can limit the specified positioning speed by entering a value here.
- "Maximum speed jog mode" input field
You can limit the specified jog speed by entering a value here.
- "Maximum motor speed" edit box
Enter a value at least 10% higher than the maximum positioning or jog speed.
- "Minimum motor speed" display field
Displays the limit for speed setpoints that was defined during motor startup.

- "Ramps" group (only for fieldbus control)**

- "Ramp 1", "Ramp 2" edit boxes
You can switch between the ramp times via PO1:Bit 14 when using fieldbus gateway control



6.2.6 Setting parameters for terminal control

For terminal control (setting "Terminal with FIO21B" in the "Setpoint/control signal source" dropdown list, see section "Setpoint selection"), you have to set the following parameters for jog and positioning mode (see following figure).

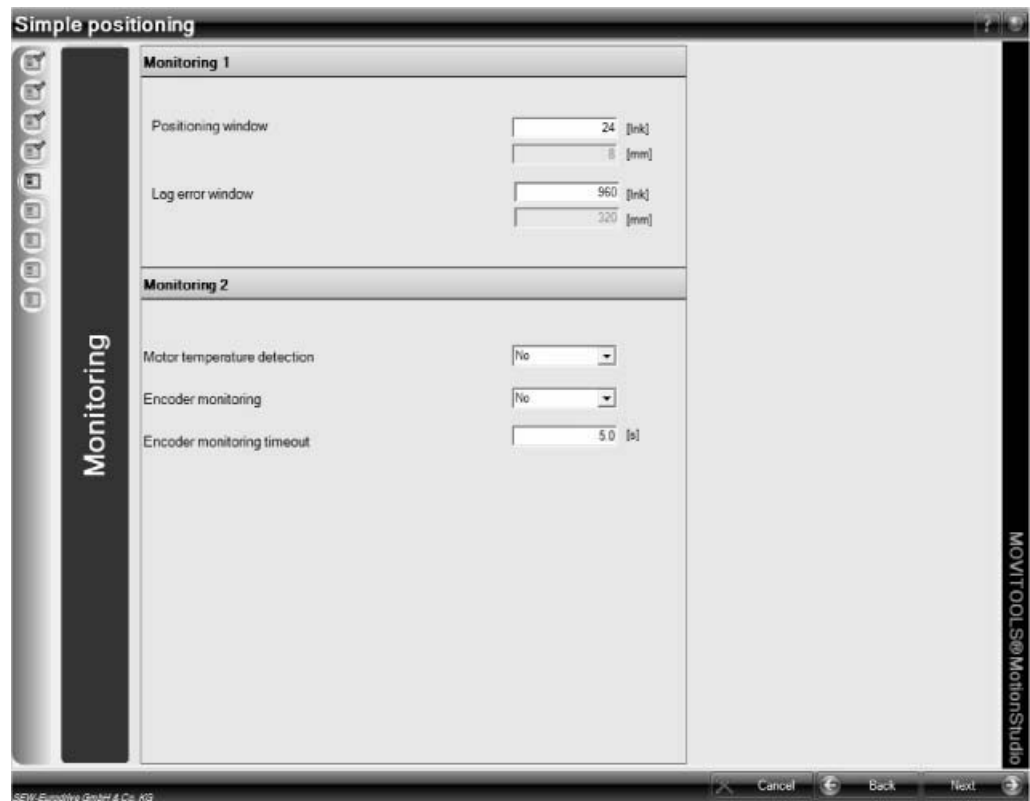
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- **"Jog mode" group**
Enter the values for rapid and creep speed and the ramp time.
- **"Positioning mode" group**
Here, you can enter up to 8 setpoint positions with corresponding ramp and speed values.



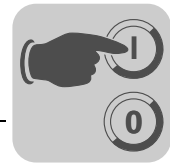
6.3 Setting the monitoring functions

Startup window for setting the monitoring functions (see following figure).



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- **"Monitoring 1" group**
 - "Position window" edit box
Positioning is completed (i.e. brake is applied) when the actual position is in this range (target position \pm position window).
 - "Lag error window" edit box
Specify a setpoint ≥ 1 to activate an additional lag error monitoring function. The function is used to monitor deviations between actual position and calculated position setpoint. If the lag distance exceeds the specified lag error window, error message F116, suberror code 42 (lag error) will be issued.
- **"Monitoring 2" group**
 - "Temperature sensor evaluation" selection field
Activate or deactivate temperature sensor evaluation (TF signal) via binary input DI05.
 - "Encoder monitoring" selection field
Activate or deactivate encoder monitoring. When encoder monitoring is activated, the encoder signals are monitored with respect to plausibility (direction of rotation) and wire breakage.



- "Encoder monitoring timeout" edit box

After the timeout interval set here has elapsed, the error message F116, suberror code 14 (encoder) is issued during startup when encoder monitoring is active and an error occurs.



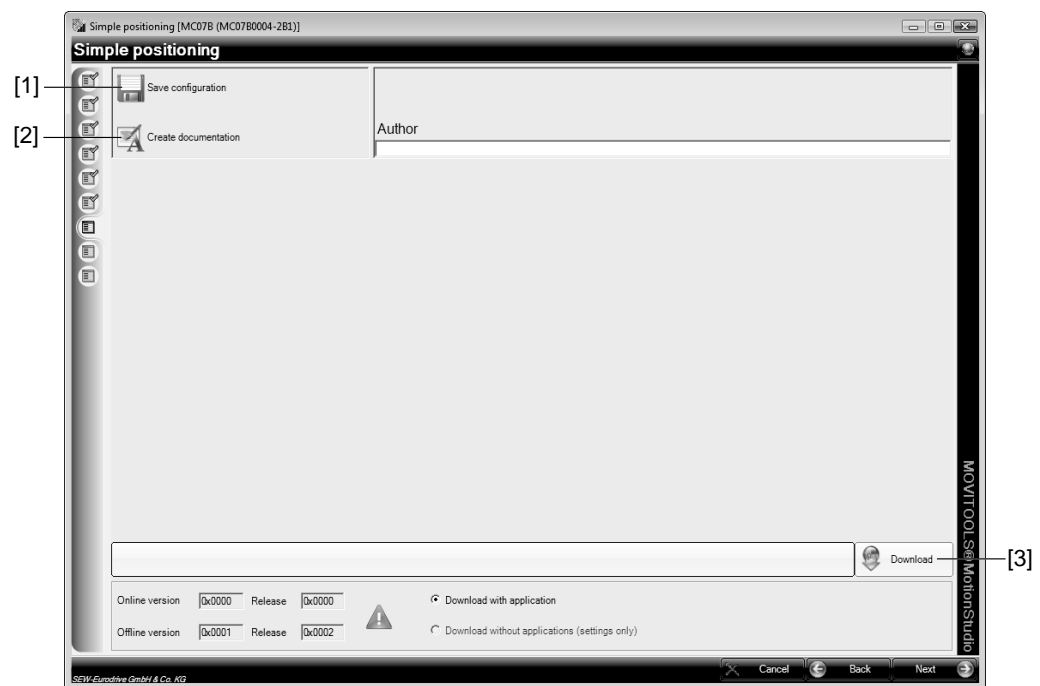
INFORMATION

For more information, refer to chapter "Monitoring functions".

6.4 Completing startup

Once you have entered all parameters, save the configuration by clicking the [Save configuration] button [1]. To generate a PDF file with the current configuration, click on [Create documentation] [2].

Click the [Download] button [3] to download the data into the inverter (see following figure).



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The following functions are performed when completing startup (download):

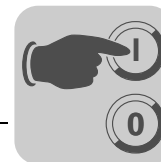
- Downloading the SHELL parameters
- Downloading the IPOS^{plus}® variables
- Downloading the IPOS^{plus}® program, if the option "Download with application" has been selected. This option is selected automatically during initial startup.



6.5 Parameters and IPOS^{plus}® variables

The following parameters and IPOS^{plus}® variables are set automatically during startup and are loaded into the inverter during the download:

Parameter P...	Index	Description	Setting
100	8461	Setpoint source	IPOS
101	8462	Control signal source	SBus1 or terminals
130	8807	Ramp t11 up	Reserved
131	8808	Ramp t11 down	Reserved
134	8474	Ramp t12 up = down	100 ms (reserved)
136	8476	Stop ramp t13	Reserved
300	8515	Start/stop speed	Motor startup parameter
301	8516	Minimum speed	Motor startup parameter
302	8517	Maximum speed	Motor startup parameter
608	8844	Binary input DI00	IPOS input/no function
Reserved		Binary input DI01	CW/stop (fixed assignment) • 0: No unit enable • 1: Unit enabled
601	8336	Binary input DI02	IPOS input/no function
602	8337	Binary input DI03	IPOS input (position)
603	8338	Binary input DI04	IPOS input (position)
604	8339	Binary input DI05	TF signal/no function
620	8350	Binary output DO01	IPOS output
621	8351	Binary output DO02	Brake released
622	8916	Binary output DO03	IPOS output
809	10204	IPOS enable	ON
870	8304	Setpoint description PO1	Control word 2
871	8305	Setpoint description PO2	IPOS PO data
872	8306	Setpoint description PO3	IPOS PO data
873	8307	Actual value description PI1	IPOS PI data
874	8308	Actual value description PI2	IPOS PI data
875	8309	Actual value description PI3	IPOS PI data
876	8622	Process data enable	1: Yes
938	8888	Task 1 speed	5
939	8962	Task 2 speed	4



IPOSplus® variable H..	Index	Description	Unit
Scaling			
H018	11018	Encoder resolution	Increments/revolution
H020	11020	Scaling distance numerator	
H021	11021	Scaling distance denominator	
H022	11022	Scaling speed numerator	
H023	11023	Scaling speed denominator	
Limits and reference travel			
H030	11030	Software limit switch left	User-defined unit
H031	11031	Software limit switch right	User-defined unit
H032	11032	Hardware limit switch 1 = active / 0 = inactive	
H033	11033	Reference offset	User-defined unit
H034	11034	Reference type	
H035	11035	Reference speed 1	0.1 rpm
H036	11036	Reference speed 2	0.1 rpm
H040	11037	Maximum speed in positioning mode	0.1 rpm
H041	11038	Maximum speed in jog mode	0.1 rpm
Ramps (with fieldbus gateway control)			
H042	11042	Ramp 1	ms
H043	11043	Ramp 2	ms
Speeds and ramps (for terminal control) – jog mode			
H061	11061	Slow speed	0.1 rpm
H062	11062	Rapid speed	0.1 rpm
H063	11063	Ramp	ms
Speeds and ramps (for terminal control) – positioning mode			
H065	11065	Table 0: Position	User-defined unit
H066	11066	Table 0: Velocity	0.1 rpm
H067	11067	Table 0: Ramp	ms
...	
H086	11086	Table 7: Position	User-defined unit
H087	11087	Table 7: Velocity	0.1 rpm
H088	11088	Table 7: Ramp	ms
Other			
H050	11050	Position window	Increments
H053	11053	Lag error window	0: Lag error monitoring deactivated 960: Default
H056	11056	Encoder monitoring 1 = on / 0 = off	
H057	11957	Encoder monitoring timeout	ms



INFORMATION

Do not alter these parameters and IPOSplus® variables after startup!



7 Operation and Service

7.1 Starting the drive

Following the download, switch to the "Simple Positioning" monitor by clicking "Next".

7.1.1 Operating modes



INFORMATION

Note that after changing the operating mode, the signals "Jog +", "Jog –" and "Start" must be delayed by 50 ms.

Control via fieldbus:

Operating mode	Invalid mode	Jog mode	Referencing mode	Positioning mode
PO1:Bit 11	"0"	"1"	"0"	"1"
PO1:Bit 12	"0"	"0"	"1"	"1"

Control via terminals:

Operating mode	Jog mode	Teach mode	Referencing mode	Positioning mode
DI10	"0"	"1"	"0"	"1"
DI11	"0"	"0"	"1"	"1"

- **Jog mode**

The drive can be moved via the "Jog +" and "Jog –" signals.

- Fieldbus control:

Specify the setpoint speed with process output data word PO2. With a value ≤ 0 , the drive runs at minimum speed.

If PO2:Bit 14 (ramp switch-over) is set to "1", ramp 2 is active instead of ramp 1.

- Terminal control (see section "Setting parameters for terminal control"):

The drive is moved with "Creep speed" and the ramp set during startup in jog mode. If the binary input DI15 is set to "1", "Rapid speed" is selected.

- **Teach mode (only with terminal control)**

In a referenced state, the current position can be saved to the previously selected table cell through an edge change (min. 200 ms per status) "0" - "1" - "0" at binary input DI12 (Start). The teaching process is successfully completed when binary output DO03 is set to "1" (position saved).



INFORMATION

A non-referenced drive is signaled via DO01 (/fault) = "0". Note that MOVITRAC® B does not display an error in this case.



- **Referencing mode**

The reference position is defined through reference travel (e.g. to one of the two hardware limit switches). Set PO1: bit 8 (or DI12) "Start" to "1" to start reference travel. The "1" signal must be present for the entire duration of the reference travel. Once reference travel has been completed successfully, PI1: bit 2 (or DO03) "Drive referenced" is set. The "1" signal at PO1: bit 8 (or DI12) "Start" can now be revoked. The drive is now referenced.

- **Positioning mode**

- In positioning mode, the drive can be positioned absolutely based on the machine zero point (reference position).
- After you have specified the setpoint speed via PO2 and the setpoint position via PO3 (or binarily selected the table cell with position bits DI13 – DI15), you can start the positioning process via PO1: bit 8 (or DI12) "Start".
- With a setpoint speed selection ≤ 0 , the drive runs at minimum speed.
- With terminal control, the ramp assigned to the selected table cell is active.
- If PO2: bit 14 (ramp switch-over) is set to "1" in fieldbus control mode, ramp 2 is active instead of ramp 1.
- If the software limit switch is activated, the drive cannot travel outside the limit switch ranges.
- A new target position is immediately adopted during traveling.
- Once the target position has been reached (\pm position window), the brake is applied and PI1: bit 3 (or DO03) "Target position reached" is set.



INFORMATION

In terminal control mode, a non-referenced drive is signaled via DO01 (/fault) = "0". Note that MOVITRAC® B does not display an error in this case.

7.2 Monitoring functions

- **Function of the hardware limit switches**

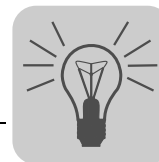
If the hardware limit switches were activated during startup, the axis is stopped (ramp t11) when it reaches a hardware limit switch. The error message F116, suberror code 29 (limit switch reached) is displayed. The error message can be deleted by reversing the direction of travel. An error reset is not necessary.

- **Moving clear of hardware limit switches**

The drive can move clear of the hardware limit switches in the opposite direction when "jog mode" is selected and the "Reset" input bit is set.



- **Function of the software limit switches**
 - Monitoring of the software limit switches is activated if the value of the right software limit switch is larger than the value of the left software limit switch during startup and if the axis is referenced.
 - In jog mode, the axis is stopped when three position windows before the software limit switch position are reached (stop ramp t13), and the error message F116, suberror code 78 (software limit switch reached) is issued. The error message can be cleared by reversing the direction of travel and resetting the error.
 - In jog mode, setting PO1:Bit 15 (or DI12) switches off monitoring of the software limit switches.
 - In positioning mode, specifying a setpoint position outside the software limit switches also leads to the error message F116, suberror code 78 (software limit switch reached). The error message can be deleted by specifying a setpoint position inside the software limit switches and by resetting the error.
- **Moving clear of the software limit switch**
 - Opposite direction of travel
The drive can move beyond the software limit switch travel range when "jog mode", the "Reset" input bit, and "opposite direction of travel" are set.
 - Direction of travel in both directions
Select "jog mode", set the input bits "Reset" and "/SWLS" (deactivated software limit switches) and the direction of travel to move the axis. It is possible to move further into the travel range of the software limit switches.
 - Reference travel
The axis is referenced again when you select reference travel and set the "Reset" input bit. You can now move the drive again in the travel range of the software limit switches.
- **Encoder monitoring function**
When encoder monitoring is activated, the encoder signals are monitored with respect to plausibility (direction of rotation) and wire breakage. In case of an error, the error message F116, suberror code 14 (encoder) is issued when the timeout interval set during startup has elapsed.
- **Lag error monitoring function**
When lag error monitoring is active, error message F116, suberror code 42 (lag error) will be issued in the event of an error.
- **Display of suberror codes**
 - Terminal control:
The suberror code pertaining to F116 is displayed on the interface of the application module and via the parameter tree in error status (P012).
 - Fieldbus control:
In addition to terminal control, the suberror code is issued via PI1: bit 8 – 15.



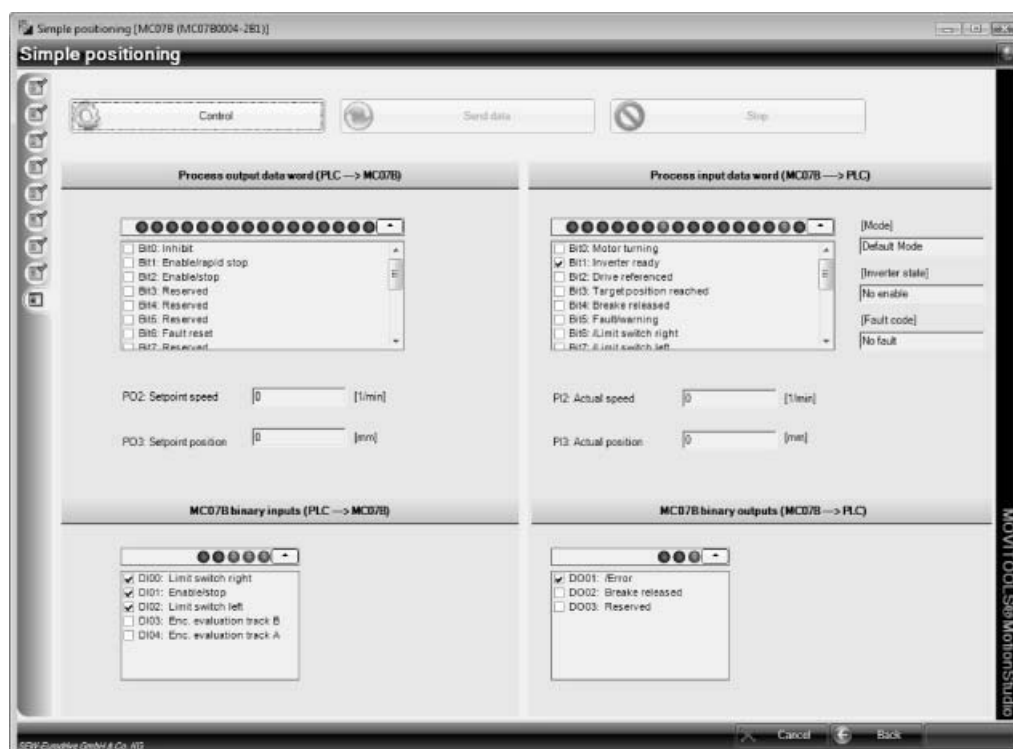
7.3 Diagnostics

7.3.1 Monitor mode

You can call up the monitor during operation by selecting [MotionStudio] / [Application modules] / [Simple Positioning]. Next click the [Monitor] button (see chapter "Start Simple Positioning", section "Start monitor").

7.3.2 Fieldbus mode

The process input and output data transferred via fieldbus are displayed in decoded form (see following figure).



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7.3.3 Terminal mode

The binary input and output signals are displayed in decoded form (see following figure).



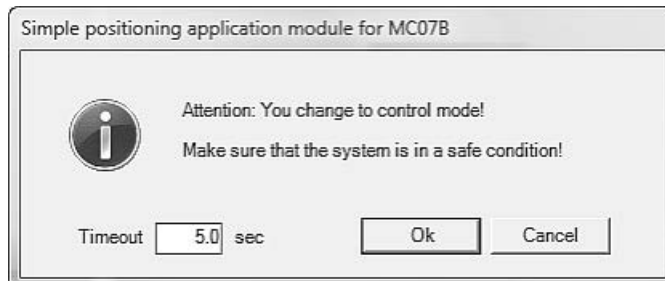
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The assignment of input and output signals depends on the selected operating mode. Read chapter "Terminal control via digital module FIO21B".



7.4 Control mode

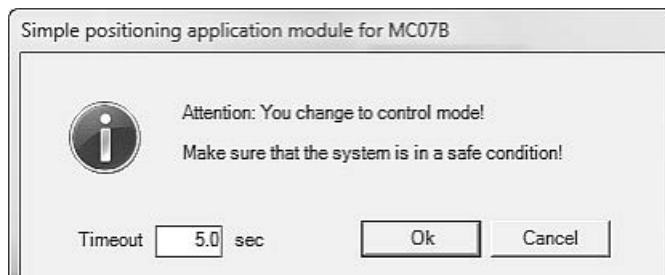
You can use the [Control] button to move the drive manually via the user interface. The process data (in fieldbus mode) or the binary signals (in terminal mode) are ignored. Before control mode becomes active, you must acknowledge the following safety note.



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- If communication is interrupted, the drive stops after the timeout interval set here.
- In control mode, you can specify the respective signals and send them to the drive by clicking [Send data].
- You can stop the drive at any time using the [Stop] button.

To go back to the status view, click the [Status] button and acknowledge the following safety information (see following figure).



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8 Appendix

8.1 Compatibility analysis for positioning with MOVIDRIVE® B / MOVITRAC® B

	MOVIDRIVE® B Positioning	MOVITRAC® B Simple positioning
Fieldbus interface	3 PD	3 PD
Terminal assignment	DI00: /Controller inhibit DI01: Enable DI02: Error reset DI03: Cam DI04: /CW limit switch DI05: /CCW limit switch DO00: No error DO01: Ready	DI00: CW limit switch DI01: CW stop DI02: CCW limit switch DI03: IPOS input for encoder evaluation DI04: IPOS input for encoder evaluation DI05: TF evaluation DO01: No fault DO02: Brake released DO02: IPOS output
Motor encoder	Direct position control	Open loop – no position control
External encoder	Direct position control	Not possible
Hiperface® encoder	Direct position control	Not possible
Encoder monitoring	Realized via firmware	Realized via IPOS ^{plus} ®
Position control	Yes (drive remains energized)	No (brake is applied, de-energized drive)
Setting range	High	Low
Ramp type	Linear	Linear or asymmetrical
Additional ramp type	Sine, square, jerk	Not possible
Reference travel	Realized via firmware (Type 0 – 8)	Realized via IPOS ^{plus} ® program (Type 3, 4, 5, 8)
Jog mode	Position-controlled	Speed-controlled
Positioning mode	Position-controlled	Speed-controlled
Positioning characteristics	Direct position control (via firmware)	<ul style="list-style-type: none"> E17C encoder type: IPOS^{plus}®-controlled run-in to target with linear deceleration ramp and controlled brake application. HTL encoder type: IPOS^{plus}®-controlled run-in to target with asymptotic deceleration ramp and controlled brake application.
On-the-fly	<ul style="list-style-type: none"> Setpoint position Setpoint speed Ramp switch-over 	<ul style="list-style-type: none"> Setpoint position Setpoint speed Ramp switch-over
Error messages: <ul style="list-style-type: none"> F78 software limit switch F79 hardware limit switch approached F14 encoder error 	Firmware trips inverter error and stops the drive	IPOS ^{plus} ® stops movement and displays error.



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